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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte RENE JEAN ZIMMER
and CLAUDE ERNEST FELIX BOES

Appeal 2007-4308
Application 10/024,869
Technology Center 1700

Decided: February 29, 2008

Before BRADLEY R. GARRIS, CHARLES F. WARREN, and THOMAS A. WALTZ, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL

Applicants appeal to the Board from the decision of the Primary Examiner finally rejecting claims 1 through 18 in the Office Action mailed December 30, 2008. 35 U.S.C. §§ 6 and 134(a) (2002); 37 C.F.R. § 41.31(a) (2005).

We affirm-in-part the decision of the Primary Examiner.

Claim 1 illustrates Appellants' invention of a tire with at least one radially outer component having projections, and is representative of the claims on appeal:

1. A tire having a plurality of radially outer rubber components, the components defining a radially outer surface (SI) of the tire and being exposed to fluids having a relative displacement with respect to the rotating tire, the tire comprising at least one radially outer component having projections, the projections being defined by first sides (2) and second sides (2') of unequal length, the first sides (2) having the greater length, delimiting therebetween an angle α ranging from 5° to 60° and forming at their intersection an apex (P), which protrudes by a height (h) from the radially outer surface (SI) from which said first and second sides originate, the second side (2') forming with the outer surface (SI) an undercut extending beneath the apex (P), and the height (h) ranging from 0.2 to 100 micrometers and in more than 75% of the projections, any plane tangent to the first side (2) of the projection cutting the radially outer surface (SI) at an acute angle.

The Examiner relies upon the evidence in these references (Ans. 4):

Drews (Drews '290)	4,180,290	Dec. 25, 1979
Drews (Drews '302)	4,284,302	Aug. 18, 1981
Löbert	4,750,693	Jun. 14, 1988
Baker	5,603,796	Feb. 18, 1997
Kemp	5,848,769	Dec. 15, 1998
Fronek	6,253,815 B1	Jul. 3, 2001
Ohsawa	US 2001/0032691 A1	Oct. 25, 2001
Tanimoto[1]	JP 06-040219 A	Feb. 15, 1994

[1] We refer to the translation of Tanimoto prepared by the USPTO (2007-001039 November 24, 2006).

Appellants request review of the following grounds of rejection under 35 U.S.C. § 103(a) (Br. 3) which have been advance by the Examiner on appeal as follows[2] (Ans. 3):

Claims 1, 2, 5 through 9, 14, 15, and 18 as unpatentable over Drews '302 in view of Froenk and optionally Drews '290[3] (Ans. 5);

Claims 15, 16, and 18 as unpatentable over Drews '302 in view of Fronek and optionally Drews '290 as applied, and further in view of Kemp (Ans. 9).

Claim 17 as unpatentable over Drews '302 in view of Froenk and optionally Drews '290 as applied, and further in view of Tanimoto and Baker (Ans. 9); and

Claims 1 through 16, and 18 as unpatentable over Ohsawa in view of Löbert and Drews '302[4] (Ans. 10).

Appellants argue the claims in the first ground of rejection as a group and further separately argue claims 2, 5, and 6. Br. 4-9. Appellants argue the claims in the second ground of rejection as a group and further separately argue claim 15. Br. 11-12. Appellants argue the claims in the fourth ground of rejection as a group and further separately argue claims 3 and 4, claim 5, claim 6, claim 7, claim 8, claim 9, claims 10 through 13, claim 14, claim 15, claim 16 and claim 18. Br. 11-14. Thus, we decide this appeal based on claims 1, 16, and 17 as representative of the four grounds of

[2] The Examiner has withdrawn the following grounds of rejection under § 103(a) (Ans. 3):
Claim 3 as unpatentable over Drews '302, , and optionally Drews '290, in view of Rethorst; and
Claims 10 through 13, 16 and 18 as unpatentable over Drews '302, , and optionally Drews '290, in view of Heinen or Ohsawa.

[3] The Examiner has withdrawn this ground of rejection with respect to claim 4. Ans. 3.

[4] The Examiner has modified this ground of rejection by withdrawing Drews '290 and Nakamura (JP 11-059135 A). Ans. 3.

rejection and on the other separately argued claims to the extent argued in the Brief. 37 C.F.R. § 41.37(c)(1)(vii) (2006).

The issues in this appeal are whether the Examiner has carried the burden of establishing a prima facie case in each of the grounds of rejection advanced on appeal.

Independent claim 1 is drawn to a tire defined by certain structure described by its shape. The terms used in this respect are given their broadest reasonable interpretation in their ordinary usage in context as they would be understood by one of ordinary skill in the art, in light of the written description in the Specification, including the drawings, without reading into the claim any disclosed limitation or particular embodiment. *See, e.g., In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004) *In re Hyatt*, 211 F.3d 1367, 1372 (Fed. Cir. 2000); *In re Morris*, 127 F.3d 1048, 1054-55 (Fed. Cir. 1997); *In re Zletz*, 893 F.2d 319, 321-22 (Fed. Cir. 1989).

With reference to, e.g., Fig. 1, the tire of claim 1 comprises at least, among other things, two or more radially outer rubber components that define a radially outer surface SI, wherein at least one of the radially outer rubber components has at least 2 projections. The term "radially outer surface" is defined in the Specification "as following the radially most exterior surface of the tire bare of any projections according to the invention." Spec. ¶ 0012. Thus, a radially outer component that in part defines the radially outer surface SI is any structure on any most exterior surface of the tire, including any part of the tread, e.g., dependent claim 10, or sidewall, e.g., dependent claim 14, and is a structure that can have projections. Therefore, the radially outer component containing the

projections is the radially outer surface SI at that part of the tire on which it is located. Thus, we hereinafter refer to the radially outer component and the radially outer surface SI at any location as the radially outer component SI for that location.

Each projection of radially outer component SI has long side 2 and short side 2' that originate from any point on the surface of radially outer component SI and intersect at apex P, forming an angle α of from 5° to 60°, and protruding over the surface of radially outer component SI by height h of from 0.2 to 100 micrometers (μm).

The shape of the surface of long side 2 is limited only by the required relative orientation of the surfaces of long side 2 and of radially outer component SI that in more than 75% of the projections, any plane tangent to any common point on the surface of first side 2, from the point of origination on radially outer component SI to its highest point at apex P, must cut the surface of radially outer component SI at an acute angle, that is, at less than 90°.[5]

The shape of the surface of short side 2' and the surface of radially outer component SI is limited only by the requirement that the second side 2' and the surface of radially outer component SI form an "undercut" extending beneath apex P. As the Examiner points out, the term "undercut" is not defined in the Specification. Ans. 5. Appellants did not refer to any portion of the Application in amending the independent claims to include this limitation. Amendment filed August 16, 2004 at 5. It seems to us the

[5] We suggest the Examiner consider whether this relationship is exhibited in Figs. 2, 3, 7, and 9, wherein the region of apex P is a curved line, in considering the scope of the claims upon any further prosecution of the appealed claims subsequent to the disposition of this appeal.

Specification Figures provide an indication that an "undercut," that is, "create an overhang by cutting material away from" as the term is commonly used,[6] is formed by the second side 2' and the surface of radially outer component SI that extends under apex P. *See* Spec. Figs., e.g., 1-6 and 8A-D. However, we find no basis in the language of claim 1 or in the Specification and the drawings in the Figures on which to read the apparent stylized structures illustrated in the Figures into the claim as limitations. *See, e.g., Zletz*, 893 F.2d at 321-22. Indeed, the illustrations in the Figures show precise shapes for the second side 2' and the surface of the radially outer component SI which would not reasonably be expected to be replicated per se when the rubber tire containing the radially outer component containing the projections is prepared via a mold, e.g., independent claim 16, or tape, e.g., independent claim 17. Thus, in giving these terms of claim 1 their broadest reasonable interpretation, we determine the "undercut" is any space under apex P creating an "overhang" to any extent that is defined in any manner by any combination of the surfaces of second side 2' and of radially outer component SI. Therefore, the height h is the height of the undercut.

Independent claim 16 is drawn to a mold for manufacturing a rubber tire wherein the mold comprises surfaces imparting at least two radially outer rubber components having at least 2 projections defined in the same terms used in claim 1. Independent claim 17 is drawn to a process of making a rubber tire with a tape providing projections protruding from the surface thereof wherein the tape is adhered to the radially outer rubber

[6] *See, e.g.*, **undercut**, *The American Heritage Dictionary of The English Language* 1875 (4th ed., Boston, Houghton Mifflin Company, 2000).

component of a rubber tire and the projections are defined in the same and similar terms used in claim 1.

We now turn to the grounds of rejection based on Drews '302 as the primary reference. We find Drews '302 would have disclosed to one of ordinary skill in this art an exterior surface of, e.g., an automobile or land vehicle including the sidewalls of its tires, that is formed with a series of adjacent wave-shaped grooves or flutes which increase propulsion efficiency by reducing opposing forces acting on the vehicle, that is, by reducing drag. Drews '302, e.g., Abstract, col. 1, ll. 6-10 and 11-27, col. 3, ll. 44-50, and Fig. 1. This person would have recognized that the term "flute" is used in context in its common, architectural sense of "[a] long, usually rounded groove incised as a decorative motif on the shaft of a column."[7] Drews '302 illustrates in, e.g., Fig. 4, a vehicle surface with a series of similar individual flutes 9 which include a depression or trough 16 that "progressively moves and curves upwardly and rearwardly to a sharp crest 17 merging with the next trough." Drews '302 col. 4, ll. 13-27. The series of flutes can be molded. *Id.*, e.g., 52-54. Drews '302 discloses that "the tires 11 may be advantageously formed with similarly treated sidewalls," which tires "formed of molded rubber may be constructed with the desired configuration integrally molded into the sidewalls, as shown for example in FIGS. 5 and 6." *Id.*, col. 5, ll. 12-17. In the embodiment illustrated in Fig. 5, the sidewall "is shown with a plurality of radially directed flutes 21 which extend substantially radially of the wheel axle." *Id.*, col. 5, ll. 18-21. Drews '302 discloses that "the same surface treatment [shown in FIGS. 1-4] may be

[7] *See, e.g.*, **flute**, *The American Heritage Dictionary of The English Language* 678.

applied to any article moving through a field [sic, fluid]," such as air. *Id.*, col. 5, l. 53 to col. 6, l. 4. Drews '302 discloses a further modification of the tire sidewall in Figs. 7 and 8, in which "[a]s the wheel rotates the finger members 28 [sic, 23] tend to deflect backwardly generally forming a curved, wave-shaped portion, and in combination define the fluted portion." *Id.*, col. 6, ll. 34-49.

We agree with the Examiner that one of ordinary skill in this art would have observed from Fig. 4 that adjoining flutes 9 form an apex at sharp crest 17, wherein the side of the first flute 9 forming the first part of sharp crest 17 is longer than the side of the second flute 9 forming the second part of the crest; the sides of the flutes 9 forming at sharp crest 17 a small acute angle; the sharp crest 17 protrudes over the layer containing the flutes 9, which layer is the radially outer surface of the tire at that location and is the layer from which the sides of the first and second flutes 9 originate; and the side of the second flute 9 and the layer containing the flutes 9 form an undercut extending under the apex at sharp crest 17. Ans. 5. We further agree with the Examiner that this person would have further observed from Fig 4 that any tangent from a point on the side of the first flute 9 forming the first part of the apex at crest 17 would cut the layer containing the flutes 9 at an acute angle. Ans. 6.

Drews '302 discloses "a surface with generally wave-shaped flutes provide an improved surface for reducing of the opposing forces on the vehicle" with "relatively minute flute surfaces."[8] Drews '302, col. 3, l. 53 to col. 4, l. 4. Drews '302 discloses "flutes 9 . . . successively directs the air

[8] In these respects, Drews '302 refers to "the inventors [sic] copending application" which is S.N. 798,417, filed May 16, 1977, that matured into Drews '290. *See* Drews '302 col. 1, ll. 11-18.

upwardly and thus acts as minute screen generators which minimize the build-up of impact pressures and establish a minimal resistance to the movement of the vehicle." *Id.*, col. 4, ll. 29-34. Drews '302 discloses with respect to Figs. 1-4 that "it is contemplated that very minute depths would be used" which in "practical implementation" "may be even significantly smaller [than 1/16 to ⅛ inch] and in some cases may advantageously be microscopic." *Id.*, col. 5, ll. 30-39, and col. 8, ll. 28-36. We find "1/16 to ⅛ inch" is 1587.5 to 3175 µm. Drews '302 discloses that "size is not considered critical, but will normally be as small as practical to produce the desired interaction." *Id.*, col. 8, ll. 36-38.

In addition to molded fluted wall structures, including rubber tires with the structures integrally molded into the sidewall (*see above* p. 7), Drews '302 discloses that the fluted structures can be "formed in any desired manner" but are "advantageously formed and applied as a separate foil-like cover member which is laminated to or otherwise secured to the vehicle by an adhesive," wherein the "foil-like cover member may have the flutes 9 . . . integrally formed with a continuous base sheet 37 adapted to be adhesively secured." Drews '302 col. 5, ll. 40-52.

We find Fronek would have disclosed to one of ordinary skill in this art an article for reducing drag caused by, among other things, air flowing over the surface of a motor vehicle, wherein the article has "a series of essentially peaks and valleys, although a variety of wave forms within the description are possible so long as they reduce the drag caused by" air flowing over the surface of the vehicle to which the article is attached. Froenk, e.g., Abstract, col. 1, ll. 5-7, and col. 2, ll. 24-29. Fronek illustrates the article in, among others, Fig. 2 in which outer patterned layer 11 has a

series of peaks and valleys triangular in shape and can be about 5 to 250 microns, that is, micrometers, thick. *Id.* col. 4, ll. 40-42. Fronek discloses that while "optimum dimensions are somewhat dependent upon the speed" of the vehicle and the range of 5 to 250 μm is "useful," "[t]he dimensions of the peaks and valleys are not critical to the invention, provided that whatever patterned surface is employed, it provides the desired reduction in drag." *Id.* col. 6, ll. 26-49. Fronek employs a microscope to examine the structure of layer 11 of exemplary embodiments. *Id.*, e.g., col. 10, ll. 37-40.

We find that Kemp would have disclosed to one of ordinary skill in this art lettering on the sidewall of a tire as illustrated in Fig. 6, wherein the lettering is formed from substantially asymmetric striae 157, 159 projections, as illustrated in Figs. 6-8, which can have a depth of approximately 0.25 mm, that is, 250 μm, and provide illumination of the lettering. The tire is prepared by molding. Kemp, e.g., Abstract, col. 2, ll. 25-35, col. 5, l. 61 to col. 6, l. 36, and col. 10. ll. 24-35.

A discussion of Drews '290, Tanimoto, and Baker is not necessary to our decision with respect to the first three grounds of rejection[9]. *See, e.g., In re Jones*, 958 F.2d 347, 349 (Fed. Cir. 1992); *In re Kronig*, 539 F.2d 1300, 1302-04 (CCPA 1976).

With respect to the first three grounds of rejection, we determine the combined teachings of the basic combination of Drew '302 and Fronek, the scope of which we determined above, provide convincing evidence

[9] We have not considered Ohsawa and Löbert with the prior art applied to claim 1 in the first ground of rejection because these references are cited by the Examiner in this respect but are not included in the statement of this ground of rejection. Thus, reliance thereon for this ground of rejection is impermissible. *See In re Hoch*, 428 F.2d 1341, 1342 n. 3 (CCPA 1970); *cf. Ex parte Raske*, 28 USPQ2d 1304, 1304-05 (BPAI 1993).

supporting the Examiner's case that the claimed invention encompassed by claims 1, 16, and 17, as we interpreted these claims above, would have been prima facie obvious to one of ordinary skill in the tire manufacturing arts familiar with the formation of structures on the sidewalls of tires. We determine that one of ordinary skill in this art would have reasonably inferred from the teachings of Drews '302 that the arrangement of flutes illustrated in Fig. 4 thereof can be used on the sidewall of a rubber tire.[10] *See above* pp. 7-8. We found that one of ordinary skill in the art would have observed in the arrangement of flutes 9 in Fig. 4 of Drews '302 certain structural features (*see above* p. 8), and determine that these structural features meet almost all of the limitations of claim 1. The exception is the limitation that apex P, formed from first side 2 and second side 2', protrudes over the surface of radially outer component SI, from which the first and second sides originate, by height h of from 0.2 to 100 μm, which is the height of the undercut thus formed. In this respect, we found that the layer containing the flutes 9 is the radially outer surface of the tire at that location, and is the layer from which first and second sides originate and which in conjunction with the side of the second flute 9, forms an undercut under sharp crest 17. *See above* p. 8.

We determine that while Drews '302 does not disclose the dimensions of the structural features of the arrangement of flutes illustrated in Fig. 4 thereof, or for any other structural features, the reference teaches that the

[10] It is well settled that a reference stands for all of the specific teachings thereof as well as the inferences one of ordinary skill in this art would have reasonably been expected to draw therefrom, *see In re Fritch*, 972 F.2d 1260, 1264-65 (Fed. Cir. 1992); *In re Preda*, 401 F.2d 825, 826 (CCPA 1968), presuming skill on the part of this person. *In re Sovish*, 769 F.2d 738, 743 (Fed. Cir. 1985).

size of the structures can be readily determined with respect to the desired effect of the structures on drag reduction and may be microscopic. *See above* pp. 8-9. Fronek also discloses that the size of drag reducing structures is determined based on the desired effect and that a series of peaks and valleys having a height within the range of 5 to 250 microns will reduce drag. We thus determine that one of ordinary skill in this art would have recognized the dimensions of structural features used to reduce drag is a result effective variable and, therefore, would have determined the workable or optimum dimensions for any of the structural features of the surfaces taught by Drews '302 including the height that sharp crest 17 protrudes over the layer containing the flutes 9. *See, e.g., In re Boesch*, 617 F.2d 272, 275-76, (CCPA 1980) (the prior art would have suggested the experimentation necessary to achieve the claimed compositions as discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art); *In re Aller*, 220 F.2d 454, 456-58 (CCPA 1955). (it is not inventive to discover by routine experimentation optimum or workable ranges for general conditions disclosed in the prior art).

We further determine that one of ordinary skill in the art would have employed the structural features of Fig. 4 of Drews '302 in preparing a mold to manufacture a rubber tire, as specified in claim 16, or to prepare a tape that can be adhered to a rubber tire, as specified in claim 17. *See above* pp. 7-8 and 9. The mold and the tape as claimed specify the same and similar structural features specified in claim 1 as interpreted above. In this respect, we determine that one of ordinary skill in this art would have

reasonably inferred that the "foil-like cover member" described by Drews '302 (*see above* p. 9) can be applied in the form of a tape.

Accordingly, we are of the opinion that prima facie one of ordinary skill in this art routinely following the combined teachings of Drews '302 and Fronek would have reasonably arrived at the claimed invention encompassed by claims 1, 16, and 17, including all the limitations thereof arranged as required therein, without resort to Appellants' Specification. *See, e.g., KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1740 (2007) ("if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill"); *In re Kahn*, 441 F.3d 977, 985-88 (Fed. Cir. 2006); *In re Keller*, 642 F.2d 413, 425, (CCPA 1981); *Sovish*, 769 F.2d at 743 (skill is presumed on the part of one of ordinary skill in the art).

We are not convinced otherwise by the contentions advanced by Appellants in again considering the record as a whole with respect to the first three grounds of rejection in light thereof. Appellants do not support their contention that Drews '302 would not have disclosed the projections required by claim 1 on the sidewall of a tire with reference to the teachings of Drews '302, other than the disclosed dimensions of "fluted projections that are in the range of about 1/16 to 1/8 in., which may be significantly smaller or 'microscopic.'" Br. 6. Appellants contend, in this respect, that "[f]lutes of this magnitude are decidedly different from the protrusion dimensions" claimed, arguing that the general language in Drews '302 that the flutes may be "microscopic" is in the context of streamlining the external surface of an automobile to reduce drag, and there is no teaching therein to

reduce the disclosed range of 1/16 to 1/8 inches to the claimed range of 0.2 to 100 μm "for a purpose unrelated to the problems that the Drews disclosure is intended to address." Br. 6. Appellants argue the projections of the claimed invention "address the problem of providing channels for water evacuation from radially outward tire surfaces that do not create structural traps for dirt and debris," and the 1/16 to 1/8 inch "sizing of the Drews channels would create dirt traps for collecting debris." Br. 7; *see also* 7-8. Appellants further contend that Drews '302 does not make clear the lower limits that would "be 'practical to produce the desired interaction,'" or what is meant by "microscopic." Br. 7.

We cannot agree with Appellants' contentions. We are of the view one of ordinary skill in the art would find in Drews '302 ample direction to use the flute arrangement of Fig. 4 with structural feature dimensions which provide the desired effect, including microscopic dimensions, for the part of the automobile where the structure is used, including the sidewall of a tire. Indeed, the disclosure in Drews '302 that microscopic dimensions will work would have led one of ordinary skill in the art to use structural dimensions smaller than 1/16 inch in the reasonable expectation of successfully reducing drag. We are reinforced in our view by Fronek which makes clear that drag reducing structures can have a height within the claimed height range. Thus, we cannot agree that the claimed height range patentably distinguishes over Drews '302 because Appellants' reason for selecting the claimed range is not that taught by the references. *See, e.g., In re Kronig,* 539 F.2d 1300, 1304 (CCPA 1976) ("[I]t is sufficient here that [the reference] clearly suggests doing what appellants have done."); *see also In re Kemps*, 97 F.3d

1427, 1429-30 (Fed. Cir, 1996) (citing *In re Dillon*, 919 F.2d 688, 693 (Fed. Cir. 1990) (*en banc*)).

> Appellants contend Drews '302 teaches in Fig. 4
>
> a concave flute side in which at least a portion of the second side to its surface of origin does not form an undercut extending beneath the apex (P). Such portions of the Drew [sic] flutes extend beyond an apex formed between a longer and shorter flute side. Clearly second side portions in Drews extending beyond the apex of the flute to a surface of origin equivalent to surface SI of the claimed invention do not form an undercut that lies beneath the apex as required in independent claims 1 and 16.

Br. 8. Appellants further contend the surface of the flute arrangement in Fig. 4 of Drews '302 that corresponds to the "surface SI" in the claims would have a "terminal point (P)" at that part of trough 16 of each flute 9 where the second side of a first sharp crest 17 and the first side of a second sharp crest 17 originate out of the surface of the layer having the flute arrangement, as demonstrated in the annotated Fig. 4 of Drews '302 submitted as Exhibit A. Br. Evidence Appendix. According to Appellants, "[a] plane T1 tangent at the terminal point (P) of a first side (2) will not cut a radially outer surface (S1) at an acute angle" as claimed. Br. 8.

We have reconsidered our findings with respect to the observations that one of ordinary skill in this art would have made from the structure of the flute arrangement illustrated in Fig. 4 of Drews '302 in light of Appellants' contentions but remain convinced that our findings are supported by Fig. 4. *See above* p. 8. We further cannot agree with Appellants' contention with respect to a plane tangent at "terminal point (P)." Indeed, applying Appellants' analysis to the structure shown in Specification Fig. 1, the corresponding terminal point P is that point at

which first side 2 originates from radially outer surface SI, and a plane tangent at that point would have the same zero inclination with respect to radially outer surface SI as does plane tangent T1 in Exhibit A. In this respect, claim 1 specifies "any plane tangent to the first side (2)," that is, at any point *on* the first side and thus, not at the point of origination of that side.

Appellants contend that the combination of Fronek with Drews '302 does not overcome the deficiencies of Drews '302 because Fronek " lacks the projections meeting the limitations of the claims." Br. 9. Appellants further contend the claimed invention achieves unexpected results because "neither reference individually or in combination can accomplish the stated objectives of the invention." Br. 9. We disagree with both contentions. Fronek does not have to disclose the claimed projections or those of Drews '302 in order for the Examiner to combine these references. *See, e.g., Keller*, 642 F.2d at 425 ("The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference . . . Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art."). Furthermore, a showing of unexpected results must be based on evidence with respect to the thrust of the ground of rejection and not on the properties of the claimed articles as argued by counsel. *See, e.g., In re Geisler*, 116 F.3d 1465, 1470 (Fed. Cir. 1997) ("[I]t is well settled that unexpected results must be established by factual evidence."); *In re Burckel*, 592 F.2d 1175, 1179-80 (CCPA 1979) (the claimed subject matter must be compared with the closest prior art in a manner which addresses the thrust of the rejection); *Hoch*, 428 F.2d at 1343-44 (evidence must provide an actual

comparison of the properties of the claimed invention with the disclosure of the reference).

With respect to dependent claim 2, delimiting claim 1 with respect to the acute angle formed by a plane tangent to first side 2 and outer surface SI, we are no more persuaded here by Appellants' contentions with respect to the angle formed by plane tangent line T1 in Exhibit A than before. *See above* pp. 15-16.

We further cannot agree with Appellants' contentions with respect to dependent claim 5 which delimits claim 1 by requiring at least two non-parallel neighboring projections oriented laterally such that longitudinal central axes thereof projected on surface SI define a non-zero angle β of from -15° to +15°. According to Appellants, "[r]ows of neighboring projections in Drews' Fig. 5 are oriented such that their longitudinal axis are parallel, not at the claimed angle," and Fig. 5 of Drews '302 can be compared with Specification Fig. 7. Br. 9. The Examiner finds "the radical alignment of Drews 302's projections as shown in figure 5 cause neighboring projections to be non-parallel and define with each other a very small acute angle." Ans. 8 and 26. We agree with the Examiner's findings with respect to Fig. 5 of Drews '302, which we find compares with Specification Fig. 9.

We further find that Appellants' do not support their contentions that the references do not teach projections having the structure required by dependent claim 6 (Br. 9) and the Examiner establishes that Drews '302 in fact shows structure falling in this claim. Ans. 8 and 26.

With respect to the second ground of rejection, the Examiner relies on Drews '302 in combination with Kemp to hold it would have been prima

facie obvious to modify the arrangement of flutes on the sidewall of a tire shown by Drews '302 as taught by Kemp in the reasonable expectation of forming lettering in view of Kemp's teaching of forming lettering from striae projections on the sidewall of a tire. Ans. 9. Appellants rely on contentions we considered above, and further advances contentions with respect to Kemp and Ohsawa. Br. 11-12. Ohsawa is not relied on in this ground of rejection. We determined that claims 1, 16, and 17 would have been prima facie obvious over the combined teachings of Drews '302 and Fronek. With respect to claim 16, we are not persuaded otherwise by Appellants' contention with respect to Kemp. Indeed, Appellants have not identified any teaching in Kemp which would have led one of ordinary skill away from combining the teachings of Drews '302 and Fronek, or from combining the teachings of Kemp therewith. Br. 11-12. That Kemp does not disclose the claimed projections or those of Drews '302 (Br. 12) does not, without more, convince us that these references cannot be combined. *See, e.g., Keller*, 642 F.2d at 425.

With respect to the third ground of rejection, we determined that claims 1, 16, and 17 would have been prima facie obvious over the combined teachings of Drews '302 and Fronek. With respect to claim 17, Appellants rely on contentions we considered above in this respect. Br. 12. Appellants' further contentions involve Tanimoto and Baker which we do not consider necessary to support the Examiner's position.

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Drews '302, Fronek, and Drews '290 alone in the first ground of rejection, as further combined with Kemp in the second

ground of rejection, and as further combined with Tanimoto, and Baker in the third ground of rejection, with Appellants' countervailing evidence of and argument for nonobviousness and conclude that the claimed invention encompassed by appealed claims 1, 2, 5 through 9, 14 through 16, and 18 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

Turning now to the fourth ground of rejection of claims 1 and 16 over the combined teachings Ohsawa, Löbert and Drews '302, we find Ohsawa would have disclosed to one of ordinary skill in this art a tire in which riblets 20 of smaller grooves 22 are formed individually on side and bottom walls of each circumferential groove 14 and each transverse groove 16. Ohsawa, e.g., ¶¶ 0014 and 0130 and Fig. 2. The individual grooves 22 can have a triangular, rectangular, trapezoidal, semicircular or other sectional shape that "have the effect to reduce the resistance to the waste flow." Ohsawa, ¶ 0164. The individual grooves 22 can be symmetrical, e.g., an isosceles triangle sectional shape or sinusoidal sectional shape. Ohsawa, e.g., ¶¶ 0131-0134, 0164, and 0167-0180, and Figs. 3, 9, and 11-13. The individual grooves 22 can be asymmetrical, e.g., triangular sectional shape with unequal legs which can be stepped. Ohsawa, e.g., ¶¶ 0203-0209 and 0250, and Figs. 15 and 26. Ohsawa does not disclose riblets 20 in which any of the grooves 22 are undercut.

We find Löbert would have disclosed to one of ordinary skill in this art a "device wherein the surface of a body in flowing medium is provided with an asymmetrical microstructure in the form of grooved profiles whose dimensions do not substantially exceed the average free travel length of the molecules of the medium or the average free travel length of the fluid particles in a turbulent boundary area." Löbert col. 1, ll. 48-54; see also,

e.g., Abstract, col. 2, ll. 18-51, and Fig. 6. "The concept of the asymmetrical microstructure of the vehicle surface is fully effective then only if the depth of the grooves does not exceed the average free travel length of the air molecules," as illustrated with subgrooves 11 of asymmetrical microstructure 10 in Figs. 4*a-c* and 5*a-c*, including Figs. 4*b* and 5*b* which illustrates grooves with undercut flanks. Löbert col. 5, l. 54 to col. 6, l. 3. The asymmetrical microstructures can be used "in those areas of aircraft where there is involved either a thin boundary layer with high friction coefficients or high local velocities." Löbert col. 6, ll. 4-30. The asymmetrical structure can be used in waterborne vehicles. Löbert col. 6, ll. 53-56.

We have considered Drews '302. *See above* pp. 7-9.

The issue in this ground of rejection is whether one of ordinary skill in the art would have modified Ohsawa's triangular sectional grooves 22 in circumferential grooves 14 and transverse grooves 16 of the tire tread to have an undercut as such taught by Löbert on the surface of a air- or waterborne vehicle and/or by Drews '302 on the sidewall of a tire. Ans. 12-13 and 32-33; Br. 12-13. We agree with Appellants that Ohsawa's disclosure of asymmetrical grooves 22 would have suggested asymmetrical triangular and other sectional shapes to one of ordinary skill in this art, but not undercut triangular shapes. We further agree with Appellants that the Examiner has failed to establish that one of ordinary skill in the art would have found in the combined teachings of Ohsawa, Löbert, and Drews '302 any suggestion to use the undercut triangular sectional structures shown in Löbert, and Drews '302 in the circumferential and transverse grooves of Ohsawa's tire tread. Indeed, both Löbert and Drews '302 disclose the use of

undercut triangular structures in a surface that is in contact solely with flowing air and/or water medium, wherein the surface does not further impinge another surface with concurrent deformation as does Ohsawa's tire tread.

In the absence of a showing of fact or a scientific explanation establishing that one of ordinary skill in this art would have modified Ohsawa's triangular sectional grooves 22 by forming an undercut in one side thereof as shown by Löbert and/or Drews '302 and would have done so with a reasonable expectation of success, we determine that the Examiner has not established a prima facie case of obviousness. *See, e.g., In re Dow Chem. Co.*, 837 F.2d 469, 473 (Fed. Cir. 1988) ("The consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art whether the prior art would have suggested to one of ordinary skill in the art that [the claimed process] should be carried out and would have a reasonable likelihood of success viewed in light of the prior art. Both the suggestion and the expectation of success must be founded in the prior art, not in the applicant's disclosure." (citations omitted)); *see also KSR*, 127 S. Ct. at 1741 ("it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does"): *Kahn*, 441 F.3d at 988 ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.").

Accordingly, we reverse the ground of rejection claims 1 through 16 and 18 as unpatentable over the combined teachings of Ohsawa, Löbert, and Drews '302 under 35 U.S.C. § 103(a).

In summary we have affirmed the grounds of rejection of claims 1, 2, 5 through 9 and 14 through 18 based on Drews '302 and Fronek and have reversed the ground of rejection of claims 1 through 16 and 18 based on Ohsawa.

The Primary Examiner's decision is affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2007).

AFFIRMED-IN-PART

tc/cam

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